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BOTANICAL SKETCHES FROM THE ASIATIC TROPICS

By Henry Allan Gleason

(*Continued from May Torreya*)

II. The Philippines

We arrived in Manila on October 6, 1913, and went out by rail the next day to Los Banos, the site of the College of Agriculture, as the guests of Dr. Frank C. Gates, of the department of botany of that institution.

The ride from Manila out to Los Banos is interesting botanically, because it gives one a general impression of tropical vegetation and scenery without bewildering one with details. Always in the background, on one side or both, are mountains, covered completely with forest, or with alternating areas of forest and grassland. When the railway comes closer to the mountain side, as it does near Los Banos, one can get a general idea of the external appearance of the tropical forest. Two features are at once obvious in which it differs from the forests of the temperate zone. One of these is the prevailing color of the bark, grays and light browns instead of the dark colors of the temperate zones. The other is the irregular height of the trees, occasional specimens projecting their crowns far above the general level of the forest.

In some places on the way out, also, the railway passes through large fields of grassland, of the same type as those seen at a distance on the mountain side. These are entirely uncultivated and uninhabited, and are unused except for pasturage for small droves of cattle. They are monopolized by the notorious cogon grasses,

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Saccharum spontaneum and *Imperata cylindrica*, and the only shrubs or trees commonly seen are scattered plants of the legumes *Bauhinia malabarica* and *Acacia Farnesiana*.

Most of the lowlands through which the railway passes are fairly well settled, with villages every two or three miles. Each village is nearly hidden under a thicket of trees of economic value, especially bamboo, mango, various species of palms, and bananas. Between the villages are extensive rice fields, with numerous scattered clumps of tall bamboos. Their tall stems are very graceful, and form spreading tops with an abundance of

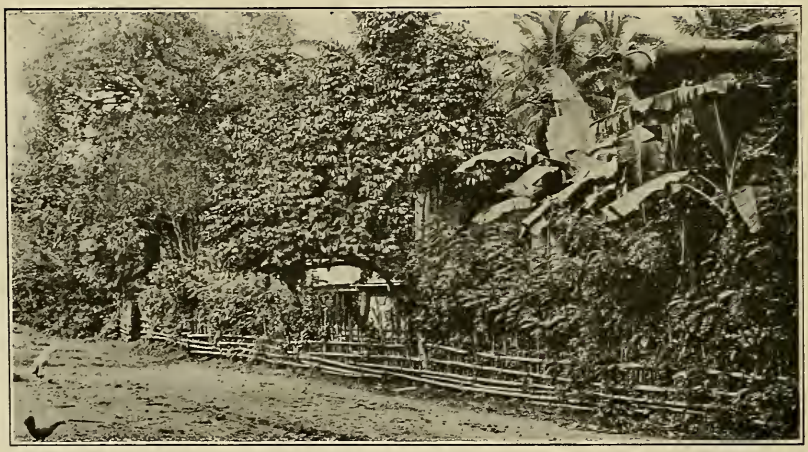

FIG. 1. Typical Philippine roadside, with several economic plants. In the center is the lansonia, *Lansium domesticum*.

feathery foliage. At a distance across a rice field, the whole gives an effect very like that of an alluvial meadow in America, with scattered thickets of tall willows beyond.

The two common species of bamboo here are *Bambusa Blumeana* and *Bambusa vulgaris*, both of them introduced into the islands in prehistoric times. They are planted everywhere, and are used for a great variety of purposes. The Filipino's house is made out of bamboo completely, except the thatched roof, and the number of minor utensils which can be and are constructed of bamboo is surprising. Of course the structure of bamboo gives it unusual advantages in this line. The long

hollow stems are at once strong, light, and straight, making them useful for all sorts of construction where a flat surface is not essential, and their hollow centers make them useful also for various sorts of containers. The bamboos grow in dense clumps, and rise to a height of fifty feet or more. These clumps increase in extent and in density from year to year, as new stems push up around and among the old ones. When stems are cut, a stump two or three feet high is left, and stumps and stems combine to make eventually a thicket which is almost impenetrable. Everywhere over the lowlands these bamboos are planted, and a couple of clumps will provide all the building material needed by an average Filipino family.

The College of Agriculture lies about two miles out from Los Banos, with an excellent road connecting them and passing on its way through the little village of San Antonio. Walking along this road, one can see an almost complete exhibition of the economic botany of the Philippines. The little square or oblong houses of the natives, with bamboo frames and floor, woven sides, and thatched roofs, are set on stilts five or six feet above the ground. Each is surrounded by a little yard, enclosed by a bamboo fence, and thickly planted. Vegetables, in the ordinary sense of the word, are seldom seen here. Most of the plants are trees and are cultivated for their fruits. Coconut palms are everywhere, and their fruits are offered for sale in every little native shop. Sugar palm, *Arenga saccharifera*, and betel palm, *Areca Catechu*, are much less frequent, although certainly common enough. Second in abundance to the coconut palm is the banana, of which many different varieties are cultivated. So far as we could see in our limited experience, the plants themselves look very much alike, but there are striking differences in the size, shape, and flavor of the fruits. They sell for various prices, ranging from a cent a dozen to five cents apiece, and some kinds are good only when cooked. There is a very striking contrast between the entire young leaves of bananas and the ragged old ones. The segments of the latter are generally only an inch or two wide, and seldom more than four inches. On very hot days the leaves fold lengthwise until the

sides are almost appressed. Water is conducted down the channeled petioles into the sheathing base, where mosquitoes breed. The margin of the leaf-sheath is almost transparent, and probably only one cell in thickness. The external surface of the leaf-sheath is exceedingly smooth. Because of this, the sheaths are used to make runways in trapping grasshoppers, since the insects can not climb over them.

Next in abundance, probably, comes the papaya, *Carica papaya*. The plant is a most ungainly affair, with a slender but tapering unbranched trunk rough with leaf scars and almost always

FIG. 2. Typical rain-forest on Mt. Makiling, Philippine Islands.

crooked, and a cluster of huge palmately-lobed leaves at the top. In this climate they grow very rapidly, and a tree two years old may be fifteen feet high and eight inches in diameter at the base. A cluster of flowers appears at the base of nearly every leaf, and the fruits ripen in rapid succession the whole year round. A first-class tree should ripen a fruit every two days, weighing one and a half to two pounds each. In general, the natives use no care in selecting their seeds and give the plants no attention, so they seldom have first-class trees. They may be seen in cultivation in the College of Agriculture, however, producing at this enormous rate. It is said that papaya fruits which are

longer than wide have seeds which tend to produce all pistillate plants, or only a small proportion of staminate ones. Seeds from thick fruits are more apt to produce an even distribution of staminate and pistillate trees.

While these three species, coconut, banana, and papaya, are the commonest fruits in cultivation, many other species are also commonly seen. Mangos, *Mangifera indica*, are very frequent. The tree is large, with a spreading crown, and resembles in habit some of our American oaks. The trees are frequently scared with a bolo, under the superstition that such treatment makes them bear more fruit. Chicos, *Achras Sapota*, grow on the same species of tree that produces chicle gum in Mexico, and was of course introduced into the Philippines from that country. The fruits are brown, the size of a lemon, rough on the outside, brown and juicy within, and taste like an overripe pear flavored with maple. The natives are perfectly willing to sell or eat the fruit, but they are superstitious about the tree, and are said to refuse to plant it. Other trees are the arnatto, *Bixa orellana*, whose crimson fruits are used to color rice; pomelo, *Citrus decumana*, with yellow fruits like a large grape-fruit, used by the Americans chiefly in salads; cacao; coffee; custard apple, *Anona reticulata*, and two or three other species of the same genus, and various others.

All these species are planted in a heterogeneous mixture around the houses, without any semblance of order whatever. The result is that, seen from a distance, the houses appear to be set within a forest. Behind the houses rise the thickets of tall bamboo, and back of the villages lie the small fields of rice or maize or sugar cane, with small patches of several kinds of vegetables. Probably the commonest of these is the gabi, or taro, *Colocasia esculentum*.

After the stranger has established himself in the Philippines, the first impression which comes to him, as it has to every other botanist in the tropics, is the overwhelming vigor of the tropical plant life. All around the college campus, one can see the steady attempt of the jungle to creep in. Some of the worst weeds are trees, and grow with almost unbelievable speed. Around the

front veranda of Dr. Gates's house were a number of trees of ipul-ipul, *Leucaena glauca*, in common use here for firewood. These trees were less than a year old, and had been cut down to the ground in June, four months before our arrival. During that interval they had grown fifteen feet high, and were full of flowers, green fruit, and ripe pods. A young tree of teak, *Tectona grandis*, planted in 1912, had during the rainy season of that year grown eight feet, producing fourteen internodes of from three to ten inches in length. In the following dry season it had produced fourteen more internodes, half an inch to an inch and a half long, amounting in all to one foot. During the rainy season of 1913 it had already produced nineteen internodes, the lowest a foot long and the uppermost not yet fully elongated, but the total length was already ten feet.

It is quite probable that there is no place in the world where the tropical forest can be observed under more favorable circumstances than on the slopes of Mt. Makiling. This extinct volcano rises immediately behind the campus of the College of Agriculture, and reaches a height of somewhat more than 3,700 feet. An excellent trail has been constructed from the campus, leading past the residences of the faculty, across the Malawin river, and thence into the deep forest. After crossing the river, the trail has several branches, so that one can use different routes to and from the summit, and can easily visit various situations on the flanks of the mountain. The value or the necessity of carefully made trails will hardly be appreciated by one who has never been in a real tropical forest. With the trails, one can easily walk to the summit in three or four hours; without them it would probably require two full days. Along the trails, the botanists and foresters have placed labels on many of the trees, giving the native and scientific names and also the name of the family. The mountain side is accordingly converted into a natural botanical garden, where the botanist can observe at his ease the vegetation in its original condition. One can easily find the labeled plants in such gardens as those at Buitenzorg and Peradeniya, or by sufficient exertion he can fight his way through the virgin forest elsewhere. Here, however, one finds

the comforts of the garden and the luxuriance of the forest together, and it affords a unique opportunity to the botanist. The nearest approach to it is found in the mountain garden at Tjibodas, in Java, but there the elevation is so much higher that a great deal of the tropical luxuriance of the lowlands is lacking.

The marvelous richness and luxuriance of such a forest must be seen to be appreciated, and baffles adequate description. One scarcely enters the forest before he is impressed by the relatively great importance of the arborescent flora. The visitor finds himself giving all his attention to the trees, and neglecting

FIG. 3. Base of a large balete, or strangling fig, showing the anastomosing trunk-roots.

almost completely the herbaceous plants along the side of his path. The number of species which compose the forest is very large. More than four hundred have been reported from Mt. Makiling. Also they are widely scattered, so that a single small area contains a very large number. In a small arboretum of about seven acres, over two hundred species were found growing naturally. As a result, a group of trees of the same species is seldom found; the nearest neighboring individuals may be and usually are separated by a considerable distance, and the number of species is so large and so confusing that the visiting botanist learns to recognize only a very few of them. These are mostly

species that are also planted on the campus below. Some others he learns as to the genus, such as *Dillenia* and *Ficus*, while the vast majority of individuals away from the trails and unlabeled are completely unknown.

In the lower two-thirds of the mountain slope, the forest is composed of tall trees, usually with a second or even a third story of lower trees beneath them. A good proportion of the individuals belongs to the Dipterocarpaceae, so that the whole forest type is called the dipterocarp forest. The trees have tall straight trunks two to five feet in diameter, with their branches appearing at a great height. The smooth light-colored bark is generally characteristic. The leaves are at so great a height, and the forest cover is so tangled with lianas that it is difficult to form any idea of the general leaf character. Now and then one finds on the ground flowers or fruits which indicate the near presence of some familiar genus. At the time of our visits. the fruits of *Dillenia* were especially common. They are green in color, spherical in shape, and about the size of a lemon. The outside is composed of the enlarged green sepals, enclosing within a twisted mass of juicy carpels. Stripped of their sepals, the carpel mass is edible, and tastes somewhat like exceedingly sour and juicy apples. In the absence of drinking water, they are useful for quenching thirst. In other places one finds the fruits of nutmeg, with an oblong seed surrounded by the network of mace, or even acorns from some of the tropical species of *Quercus*.

Palm trees are not common. Here and there one meets with a slender fan palm twenty to thirty feet high, but they are so rare that they never constitute an important part of the forest, and from most points along the trail no palms are in sight at all. This does not include the rattans, species of the genus *Calamus*. These climbing palms are common everywhere through the forest, stretching to immense distances but never getting very high above the ground. Their trunks, including the bristly leaf-sheaths, may be six inches in diameter, and at the base are reclining on the ground. Farther out they ascend obliquely into some tree, and thence may be traced looping away from one

tree to the other across the forest. *Calamus* is one of the many genera that make a trail necessary through the forest. Its stems and petioles are thorny, and being green in color they are not easily seen against the green background. Worse than these, it has a thorny prolongation of the leaf rachis, called a whip, which is one of the most murderous things met with in the forest. This elongated rachis begins by growing upward, and if it meets with an obstruction, such as the limb of a tree, the reflexed thorns upon it catch and support the plant. But if an obstruction is not met with, the whip soon hangs down from its own weight. These pendent whips are common all through the forest, so slender and so green that they are scarcely noticed, but so strong, and armed with such sharp thorns, that they never let go of anything which they may catch. Luckily, the hat brim catches most of them. Off comes the hat, and the owner must turn around and pick it off the whip where it hangs suspended. But if the whip catches the clothing, or still worse, the person, a piece of cloth or of skin will come out before the whip lets loose. So the path of the botanist away from the cleared trail is indeed beset with thorns.

Other forms of lianas are everywhere, and constitute one of the most striking features of the forest. There are twiners, root climbers, and tendril climbers. There are little species, appressed to the trunks of trees, and big fellows a foot in trunk diameter, and so tall that their foliage is lost in the general forest cover. They climb on the trees, they climb on each other, they stretch across the path and from tree to tree in great festoons and loops. They disappear into the upper branches, or they hide the tree trunks behind dense masses of green foliage. They exist in dozens of species, in every shape and size and habit of growth imaginable. Also, for the most part they are unidentified and almost unidentifiable, because it is practically impossible to find the leaves or flowers of the larger ones.

Of the smaller lianas, species of *Pothos* are common. Their slender stems lie closely appressed to the trunks of large smooth-barked trees, and seem to show a special preference for the surface of buttress roots. Their leaves are similarly appressed to

the bark, and spread at right angles to the stem. Some of the smaller species have leaves less than an inch long, and the larger ones are four to six inches long. Species of *Piper* are also low climbers with a somewhat similar habit, but with more spreading leaves.

Next in size are the aroids, with many different species. They are root climbers, but the large leaves are produced in great numbers and may completely hide the trunk of the supporting tree. A climbing bamboo, *Schizostachyum*, is also very common. It produces a dense but loose tangle of stems, which may double the apparent diameter of the supporting tree, and the small leaves are produced freely over the whole mass. A larger bamboo, *Dinochloa*, has rather solitary stems. These smaller lianas, *Pothos*, *Piper*, *Schizostachyum*, and the aroids, represent the shade-loving species. While it is frequently considered that the liana habit may have developed in response to a demand for greater light within the forest, it is obvious that it has developed to a variable degree, because to these smaller species the amount of light available is certainly not very different from that received by plants of normal stature on the ground. Just how much that is, is not definitely known, but in photographing them the necessary exposure is one hundred to three hundred times as great as would be required in the open. Whether these shade-loving forms have developed from shade-loving ancestors, or from larger sun-loving lianas, is a question of considerable interest to the ecologist.

The larger lianas all differ from these in having long leafless stems, with the foliage developed only at a great height, where it can compete for light with the leaves of the trees which support them. Of course they must begin their development on the ground, and there may be a very long and severe struggle for existence before they finally attain the requisite height. Just how large these plants may be is again a question, because in several trips on the slopes of Mt. Makiling the writer was never able, even with the aid of a field glass, to recognize with certainty the foliage of any particular liana from that of the trees around it. It is probable that their development is favored by the

death and fall of a large tree, affording a temporary clearing in the forest. This view is favored by their great abundance under certain trees, and their smaller numbers over the adjacent ground. Most of them are twiners, but the death of the first plants upon which they twined leaves the lower part of the stem unsupported, sometimes for probably a hundred feet up into the air. Even allowing for the possible death and disappearance of former supports, it is still difficult to imagine how they are able to loop from one tree to another as they do, without any present support for a distance as great as fifty feet. It is very probable that the liana is itself connected with the death of the supporting plant, because instances are common where small supporting trees are badly constricted by the tight coils about them. It is also common to find two or even three twiners coiled about each other, and ascending in a tight spiral many feet into the foliage above. Of all the numerous species and genera on the mountain, only one genus was ever recognized with certainty. That was *Bauhinia*, known by the 8-shaped section of the stem.

Equaling the lianas in general interest are the baletes, or strangling figs, of which fourteen species are known on the mountain. In general, however, it is not only impossible for the botanist to recognize the species, but even to distinguish one species from another. On the mature trees the foliage is so high that it can not be seen, and the flowers and fruit are also necessary for the identification of the species. A few species are cauliflorous, and may be seen in bloom at close range. One such species had the lower part of its trunk almost completely hidden beneath a tangle of inflorescences, each a yard long and bearing some hundreds of small obovoid figs.

But whether the species can be recognized or not, it is possible to observe with a good deal of accuracy the stages in the growth and development of a balete. The seeds germinate on the surface of some horizontal branch, or in a crevice in the bark of a tree, sometimes at a considerable height. Here the young plant begins its life as an epiphyte. Such plants may be seen commonly in the forest, with a thick cluster of stems extending out and up obliquely from the side of a tree. Just how high their

development may begin can not be said accurately—probably there is no limit. Soon after the establishment of the young plant, a series of roots begins to grow downward along the bark of the host tree. When these reach the ground and take root, the fig is converted from an epiphyte into a holophyte, and henceforth contributes to its own physical support. It is obvious that the growth of a large epiphyte is rather hazardous, because of the difficulty of obtaining an adequate supply of water and inorganic materials, and this condition may set the upper limit of height at which the balete may develop. In other words, if the balete seedling is too high, it may starve to death before its roots establish connection with the ground. In the younger baletes under observation, where the point of attachment could be readily observed, it was seldom more than twenty feet above the ground, but in one case the height was at least forty feet at a conservative estimate. In this particular balete, there was just one straight root descending without branches to three feet from the ground, and then branching and entering the ground in two places. Most baletes send down several roots, which branch and anastomose freely on the way. Possibly the unusual habit of this one enabled it in some way to reach the ground from so great a height.

Most baletes observed had germinated on the side of a comparatively small tree, seldom exceeding two feet in diameter at the point of attachment. Even on a tree of only six inches diameter, the mechanical strain of supporting a young balete can not be very great. The branches of the balete, also, are under those of the host, and can not interfere with the light. The first danger to the host comes from the roots which grow down the sides of the stem. These branch repeatedly, surround the stem within a short distance from their base, and anastomose freely to form a complete network around the tree. This mesh of roots is so thick and strong, that it is very doubtful whether the host can grow in thickness after it is once established. At any rate, by the time the mesh work has become a solid mass around the tree within, the host dies, and the balete now enters on a completely independent existence. On the younger ones,

the mesh work of roots is still obvious, or is indicated by the irregularity of surface. On the older ones it is smoothed out completely by successive years of growth, and the mature balete becomes a tall, straight, smooth-barked tree, six to eight feet in diameter, with its branches and foliage lost to view in the forest canopy above, and with no trace whatever of its earlier epiphytic history. Of course they are hollow, and on one cut balete the decaying mass of the host tree was very evident.

Baletes exist in the Makiling forest by the thousands. Without walking from the trail, one can see them in every stage of

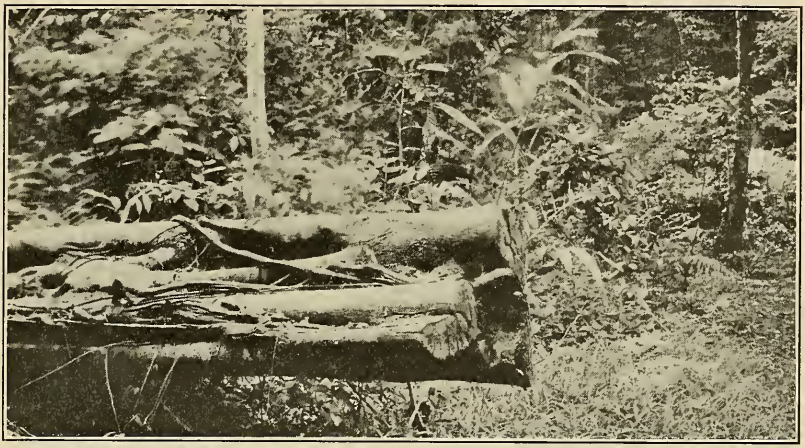

Fig. 4. A felled balete showing four principal roots and a central cavity filled by the decayed remains of the host tree.

existence, from the small epiphytes on the host tree to the giant mature tree. No two of them look exactly alike in their intermediate stages, because their descending roots differ in size, in number, and in the amount of anastomosing, and the botanist will not tire of examining all of them that he sees.

The mature baletes, and many other species of the tropical forest, show in a very interesting way the development of huge buttress roots of the plank buttress type. These may be fourteen feet long, eight feet high at the base, flat, vertical, and straight, and even at the base scarcely exceeding a foot in thickness. They stand out from the main trunk, at all angles and in

all lengths, without any symmetry or regularity. Their bark is generally of the same color and surface as that of the main trunk. It is quite evident that the various species may differ in the number, size, straightness, and thickness of the buttresses, but their general character is the same.

The herbaceous vegetation must not be neglected completely. There are tall plants of the Marantaceae, with canna-like leaves, growing close beside the trail. Under them are many other species of unknown genera or families, but everywhere there is a multitude of the shade-loving Elatostemmas. These small

Fig. 5. A tangle of lianes. Philippine Islands.

relatives of our temperate zone nettles are easily the most characteristic members of the herbaceous flora of these densely shaded forests. Their plagiotropic stems arch out from the base, and the leaves are so inserted as to lie in a horizontal plane, thereby receiving the maximum proportion of the diffuse light. The leaves are inequilateral at the base, resembling those of a begonia. There are also numerous ferns, especially along the rocky banks of the small streams which course down the mountain-side.

One tall semi-shrubby plant of the Marantaceae (? *Donax arundastrum*) is quite noticeable because of its habit of growth.

In general habit it suggests the cultivated umbrella plant, *Cyperus alternifolius*. A tall erect stem reaches a height which may be as much as eight feet, and consists apparently of but one internode. At the summit it bears a whorl of branches, which stand horizontally or at some oblique angle. These consist also of one internode each, and may bear tertiary branches at their summits in turn.

The trail winds on up the side of the mountain, past giant baletes and under giant lianas, now turning around a shoulder of the mountain, now descending slightly to cross one of the numerous small streams, and then ascending steeply on the other side. In every direction the dense forest intercepts the view. One never gets a glimpse of the valley which he has left, or of the peak which is his goal. He must merely continue along the trail, knowing that in due time it will lead him to the summit. Little lizards scurry silently off the path into the vegetation at the side, gallinaceous birds scratch in the leaves and hurry away when alarmed, a pair of unseen songbirds whistle to each other in the treetops overhead. The animal life is smothered and lost in the overwhelming luxuriance of the vegetation, and the few sounds heard in evidence of its presence impress one by their mystery and secrecy. The only exception comes from the hoarse-voiced hornbills, whose raucous cries are heard frequently, although the big birds themselves keep well hidden.

Approximately a third of the way up the mountain the forest decreases in height, and consists now of two stories of trees where there had been three before. The general character of the vegetation, however, is virtually unchanged. The general size of the lianas is decreased. The screw-pine, *Pandanus*, becomes relatively common. Great masses of the climbing pandan, *Freycinetia*, join with the aroids in covering the trunks of the trees. Occasionally among the trees one gets a glimpse of a giant erect aroid, of a species as yet unnamed, with a trunk ten feet tall or more, and with spreading leaves whose length, including the petiole, may reach twelve feet. A leaf of that size on a palm is not very impressive, because the leaves there

are compound, but when it exists as a single unlobed blade it is immense, and carries the impression of a size even greater than the actual figures would indicate.

The trail becomes steeper, and about two thirds of the way up there is a more pronounced change, where the trail enters the mossy forest of the summit. Here the forest becomes one story in height. The species of trees change considerably also, and the whole aspect of the forest is entirely different. The trees are low, widely branched, with numerous crooked spreading branches, and with small or leathery leaves. Their stems and branches are completely hidden within dense enveloping masses of lichens and mosses. These masses frequently increase the apparent diameter of the branch fourfold. On the branches, among the mosses, are great numbers of epiphytes, including many species of orchids. The latter are mostly narrow-leaved, and with rather inconspicuous flowers. The ground vegetation, because of the greater amount of light available, is a dense mass of low shrubbery, in which various species of *Eurya* and *Medinilla* are especially conspicuous. The trail twists its way through these stiff-branched shrubs and under the moss-laden trees up the last steep slopes, and emerges at the shelter house on the summit.

Makiling enjoys the reputation of being the most carefully studied mountain, from an ecological standpoint, in the world. For some years past Dr. Brown has worked over its vegetation, and has maintained batteries of self-recording instruments at numerous stations, from the hot steamy base to the wind-swept summit. His results, when published, should present the most accurate and detailed account of tropical vegetation extant.

This description may give some idea of the facilities which the mountain offers to the student of tropical vegetation. To the traveller with little time to spare, it makes easily accessible two great types of tropical forest, and exhibits all of the principal vegetation forms of the tropical forest, except those which are purely littoral in nature. To the student who wishes to make more careful or extended studies, it offers large and inexhaustible supplies of material, even including such unusual forms as the

myrmecophilous *Hydnophytum* and the saprophytic *Rafflesia*, with the additional advantage of a botanical laboratory, American homes, and American botanists at its base.

(To be continued.)

RELATIONSHIP BETWEEN ROESTELIA TRANSFORMANS AND R. BOTRYAPITES

By B. O. Dodge

Roestelia transformans is one of the few rusts of this type that have remained unconnected with a *Gymnosporangium* form. Several European works on the fungi contain statements to the effect that *Gymnosporangium Ellisii* is connected with *R. transformans* but no one has reported making such a connection. Fromme has recently shown that *G. Ellisii* and *Aecidium Myricatum* are phases of the same rust.

Farlow, in his work on the "Gymnosporangia of the United States," describes a foliicolous form of *G. biseptatum* as having "all or nearly all two-celled spores." Kern has made a new species of this leaf form under the name *G. fraternum*.

A number of infection experiments with *G. biseptatum* and "*G. fraternum*" have been carried out at Columbia University and a more detailed report of the results obtained will soon be published. It has been found that the leaf form will infect both *Aronia* and *Amelanchier*. The roestelia developing on *Aronia* are very characteristic of *R. transformans*. The basal hypertrophies from which secondary horn-like galls arise, and the long, strongly hygroscopic peridial cells, coarsely warted on their inner face, have been generally regarded as unmistakable characters of this species.

The hypertrophies produced by the infection on the *Amelanchier* are quite unlike those on the *Aronia*. The galls from which the roestelia arise do not ordinarily coalesce and are at first merely flattened, wart-like growths which later elongate somewhat. The roestelia are very different from *R. transformans*, resembling, in fact, *R. Botryapites* as commonly described and distributed in exsiccati.